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CHER CENTER FOR HEALTH ECONOMICS RESEARCH

300 Fifth Avenue, 6th Floor
Waltham, MA 02154
(617) 487-0200
(617) 487-0202 Fax

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EFFECT OF LOCAL SMOKE-FREE RESTAURANT POLICIES ON RESTAURANT REVENUE IN MASSACHUSETTS

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Submitted by:

Gregory C. Pope, M.S.
William J. Bartosch, M.P.A.

Center for Health Economics Research
300 Fifth Avenue, 6th Floor
Waltham, MA 02154

To:

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Tobacco Control Program

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EFFECT OF LOCAL SMOKE-FREE RESTAURANT POLICIES ON RESTAURANT REVENUE IN MASSACHUSETTS

Research evidence linking environmental tobacco smoking (ETS), or "second-hand" smoke, to smoking-related illnesses have led many cities and towns across Massachusetts to adopt polices that completely eliminate or severely restrict smoking in restaurants. At least 124 localities in Massachusetts have passed some type of restaurant smoking restriction. Forty-two of these communities can be considered highly restrictive meaning they offer a smoke-free dining environment that either completely eliminates smoking in restaurants or only allows smoking in separate, enclosed, and separately ventilated sections of restaurants.

One of the most controversial aspect of smoke-free restaurant policies is the possibility that prohibiting smoking is economically harmful to restaurants because patrons who smoke may migrate to communities without such restrictions or choose to dine at home. This study examines whether local policies restricting smoking in restaurants affect restaurant business.

RESEARCH HYPOTHESES

Our null hypothesis is that there is no difference between pre- and post-ban meals revenue. Two alternative hypotheses are possible. One hypothesis is that local smoking bans reduce restaurant receipts as smokers patronize establishments in these communities less frequently. Another hypothesis is that smoking bans stimulate patronage from those preferring a smoke-free dining environment causing an increase in post-ban receipts.

DATA

This study analyzed taxable meals receipts data collected by the Massachusetts Department of Revenue (DOR) for the period January 1992 through December 1995. These data capture information pertaining to the state's five percent tax on meals. They include taxable receipts from all eating and drinking establishments that are primarily engaged in the business of serving meals and include receipts from the sale of alcoholic beverages. DOR provided aggregate town-level data for all communities with at least ten restaurants.

Data were adjusted for inflation using the Consumer Price Index (CPI) for Boston urban consumers with 1995 as the base year. This allowed us to make comparisons across time that control for the changing value of the dollar.

EXPERIMENTAL AND CONTROL COMMUNITIES

Experimental communities included cities and town in Massachusetts that adopted a highly restrictive policy between January 1992 and December 1995, including those communities that adopted a policy and subsequently revoked it (i.e. Chicopee and Norwell). Highly restrictive restaurant policies have generated the most economic concern. They include any city ordinance, town by-law, or local board of health regulation that completely restricts smoking in restaurants or confines smoking to separate, enclosed, and separately ventilated sections of restaurants. In order for a town

to be considered highly restrictive, its restaurant policy had to apply to taverns and bar sections of restaurants. However, a community's restaurant policy could exempt bars (meaning establishments primarily dedicated to serving alcoholic beverages and in which the consumption of food is incidental to the consumption of beverages) and still be considered highly restrictive.

We identified the smoking status of 309 of Massachusetts' 351 cities and towns representing 98 percent of the state's population. Those localities not included failed to submit local data collection forms to the Department of Public Health and could not be reached via telephone. We identified 33 communities that adopted a smoke-free policy between January 1992 and December 1995. These cities and towns are listed in Table 1. Thirty-one of these communities had data available for the entire reporting period and were included in our analysis. DOR suppressed data for Dover and Norfolk to preserve confidentiality because of the small number of restaurants in these towns. West Springfield and Sunderland were excluded from the descriptive analysis because they didn't have six months of post-ban data. They are, however, included in the multivariate analysis.

Those cities and towns that did not enact a smoke-free policy served as control communities. This group included 222 cities and towns that did not adopt a restaurant policy or that passed relatively weak polices (e.g., simply designating a percentage of seats non-smoking). Typically, critics of smoke-free policies do not claim that weak restrictions cause economic hardship. Cities and towns with fewer than 10 restaurants between 1992 and 1995 or whose smoking policy status was unknown were excluded from the control group.

DESCRIPTIVE ANALYSIS

Methods

Table 2 shows inflation-adjusted pre- and post-ban data for each of the smoke-free communities with at least 6 months of post-ban data. Post-ban taxable receipts are the total taxable meals receipts generated in each experimental community in the 6 months immediately following the implementation of a restaurant smoking ban. Pre-ban receipts are the total taxable meals revenue that were reported in the corresponding six months one year earlier. Examining the same six month period one year apart controls for seasonal variations in restaurant business. For example, if a community adopted a smoke-free policy on January 1, 1995, its post-ban period would be January 1995 through June 1995. Its pre-ban period would be January 1994 through June 1994. Pre- and post-ban data for control communities was extracted for the same time period as the individual experimental community. These time periods differ across experimental communities.

Results

The percentage change in adopting town restaurant receipts between pre- and post-ban periods ranges from -12 percent to over 100 percent. This is a reflection of the volatile nature of the restaurant business, with restaurants frequently going in or out of business, and experiencing large swings in patronage. The largest changes tend to be among the smallest towns with the fewest restaurants.

It is more meaningful to focus on the aggregate results across all towns rather than the results for any individual town. Aggregate receipts, such as for the combined control communities, are much more stable because they smooth out fluctuations in individual town receipts. For the experimental (adopting) communities as a whole, inflation-adjusted restaurant receipts were 5 percent greater in the six months following imposition of a smoke-free policy than in the same six months one year earlier, pre-ban. In contrast, there was virtually no change in sales in control communities that did not adopt smoke-free restrictions. The comparison of experimental and control communities indicates that adoption of highly-restrictive restaurant smoking policies led to an increase of about 5 percent in restaurant receipts in the six months following the imposition of the ban.

We now turn to a multivariate analysis to examine the statistical precision of this estimated sales gain.

MULTIVARIATE ANALYSIS OF SMOKING RESTRICTION POLICIES

Methods

To estimate the average effect of smoke free policies controlling for seasonal and year effects, we used multivariate regression. A "panel data" framework was used in which 48 months of inflation-adjusted restaurant sales data from each of 255 towns was combined. "Fixed effects" were entered for each town. The town fixed effects remove all town-specific factors affecting restaurant sales that do not vary significantly over time, such as town size. Dummy variables for each quarter of the year were entered to eliminate seasonal influences on restaurant sales. In one of our model specifications, we also control for time period effects through the use of a "year" factor (i.e., 1992, 1993, 1994, and 1995) in addition to the town factors. Time period effects control for general economic trends, data collection methods, and other factors that vary over time across all towns.

Removing the influence of these other factors allows us to obtain an unbiased estimate of the effect of smoking restrictions on restaurant sales. A dummy variable called ADOPT was included in the regression to capture the effect of smoking restrictions. ADOPT is coded "one" for all town-months in which a smoking restriction was in effect, and "zero" for all town-months in which a smoking restriction was not in effect. The regression coefficient of ADOPT estimates the change in restaurant sales during the months a smoking restriction was in effect in a town, compared to months a restriction was not in effect. The 222 towns that never adopted a smoke-free policy are included in the regression, and function as "control" communities. That is, changes in restaurant sales in non-adopting towns control for general economic and other trends that affect restaurant sales across all towns. The regression averages smoking restriction effects across all adopting towns, resulting in a single estimate of the average or typical effect for a town.

There was some evidence of autocorrelation of error terms in our models, so we also estimated a model corrected for autocorrelation. Autocorrelation refers to serial (temporal) correlation of model error terms, and can bias statistical results. All models reporting here use the natural logarithm of taxable meals receipts as the dependent variable.

Preliminary Results

Results from three regression models are presented in Table 3. They are: (1) town fixed effects; (2) town fixed effects corrected for autocorrelation; and (3) town and year fixed effects. All models indicate that smoke-free restaurant restrictions increased restaurant receipts in towns adopting smoke-free policies, by 5 to 9 percent. This is consistent with the descriptive results. The range of uncertainty of the estimates is 0 to 12 percent, indicating that the measured positive effect of smoking restrictions is unlikely to be due to random fluctuations (noise in the data). There is no support for the hypothesis that restaurant smoking restrictions reduced restaurant receipts.

Further Work

In further work, we will examine the sensitivity of our results to trends in town economic conditions that may affect restaurant sales. Economic conditions will be measured alternatively by town taxable retail sales, or by county population and disposable personal income. Controlling for these factors will remove any bias that may arise from more favorable economic trends in towns that adopted smoking restrictions than those that did not.

TABLE 1

MASSACHUSETTS CITIES AND TOWNS THAT ADOPTED SMOKE-FREE RESTAURANT POLICIES THROUGH 1995

CITY/TOWN	DATE EFFECTIVE
Amherst	September 1, 1994
Andover	July 13, 1994
Arlington	June 15, 1995
Bedford	February 1, 1995
Belmont	January 1, 1995
Brookline	July 1, 1994
Chicopee	June 1, 1994 [a]
Dover	June 3, 1994 [b]
Easthampton	September 1, 1994
Framingham	January 1, 1995
Greenfield	November 15, 1994
Holden	February 15, 1994
Holyoke	August 1, 1994
Lanesborough	January 1, 1994
Lee	July 1, 1995
Lenox	July 1, 1995
Lexington	February 15, 1995
Medfield	April 1, 1994
Montague	June 1, 1995
Norfolk	August 1, 1995 [b]
Northampton	July 21, 1995
Norwell	April 1, 1993 [c]
Plymouth	November 18, 1994
Reading	July 1, 1995
Sharon	August 7, 1994
South Hadley	August 1, 1994
Southampton	September 1, 1994
Stockbridge	July 1, 1995
Sunderland	November 1, 1995
Swampscott	November 15, 1994
Tewksbury	February 1, 1995
Wakefield	July 1, 1995
West Springfield	December 1, 1995

NOTES

[a] Repealed February 22, 1995.

[b] Data unavailable because fewer than 10 restaurants reported.

[c] Repealed May 24, 1994.

A "smoke free" restaurant policy is a 100 percent restaurant smoking ban or a requirement for a separately-ventilated room.

SOURCES: Massachusetts Department of Public Health, Tobacco Control Program, Ordinance Update Forms
National Cancer Institute, Major Local Tobacco Control Ordinances in the United States, May 1993.
Local Boards of Health

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TABLE 2

CHANGE IN TAXABLE MEALS RECEIPTS IN TOWNS ADOPTING AND NOT ADOPTING SMOKE-FREE RESTAURANT RESTRICTIONS

	ADOPTING COMMUNITY (EXPERIMENTAL)			NON-ADOPTING COMMUNITIES (CONTROL, IN 1,000s)		
City/Town	Pre-Ban	Post-Ban	Percent Change	Pre-Ban	Post-Ban	Percent Change
Amherst	$11,644,294	$11,765,601	1.0 %	$2,366,486	$2,278,375	-3.72 %
Andover	18,740,360	23,369,532	24.7	2,564,851	2,474,916	-0.04
Arlington	9,643,463	9,885,862	2.5	2,582,798	2,652,931	0.03
Bedford	2,276,148	4,408,295	93.7	2,563,680	2,567,141	0.00
Belmont	3,134,536	6,364,522	103.0	2,421,973	2,445,178	0.01
Brookline	34,876,741	31,171,945	-10.6	2,626,228	2,538,328	-0.03
Chicopee	14,691,268	14,154,599	-3.7	2,677,749	2,627,268	-0.02
Easthampton	6,733,684	6,986,286	3.8	2,366,486	2,278,375	-0.04
Framingham	24,157,512	28,220,433	16.8	2,421,973	2,445,178	0.01
Greenfield	6,329,741	5,707,984	-9.8	2,321,422	2,296,316	-0.01
Holden	5,228,578	4,687,371	-10.4	2,537,710	2,636,711	0.04
Holyoke	10,533,049	9,931,308	-5.7	2,503,475	2,411,503	-0.04
Lanesborough	1,385,950	1,390,521	0.3	2,341,264	2,421,973	0.03
Lee	3,092,370	3,871,615	25.2	2,538,328	2,611,689	0.03
Lenox	8,259,734	8,752,893	6.0	2,538,328	2,611,689	0.03
Lexington	10,308,913	9,731,410	-5.6	2,636,711	2,633,404	0.00
Medfield	3,266,437	3,742,039	14.6	2,718,092	2,810,376	0.03
Montague	2,074,286	1,825,341	-12.0	2,627,268	2,694,173	0.03
Northampton	14,518,364	18,660,209	28.5	2,169,147	2,246,153	0.04
Norwell	1,745,219	1,573,014	-9.9	2,688,585	2,718,092	0.01
Plymouth	12,032,650	12,413,724	3.2	2,321,422	2,296,316	-0.01
Reading	3,035,186	2,835,286	-6.6	2,538,328	2,611,689	0.03
Sharon	2,123,464	2,611,407	23.0	2,469,228	2,378,221	-0.04
South Hadley	3,021,426	3,504,782	16.0	2,503,475	2,411,503	-0.04
Southampton	456,537	514,301	12.7	2,366,486	2,278,375	-0.04
Stockbridge	4,175,511	4,413,171	5.7	2,538,328	2,611,689	0.03
Swampscott	8,360,901	8,425,002	0.8	2,321,422	2,185,661	-0.06
Tewksbury	6,156,509	5,416,929	-12.0	2,563,680	2,567,141	0.00
Wakefield	38,435,772	38,345,558	-0.2	2,538,328	2,611,689	0.03
Total	$270,438,602	$284,680,937	5.3	$72,373,249	$72,352,053	0.00

NOTES:
Data are for six months post-ban and corresponding six months one year earlier (pre-ban).
Data for non-adopting (control) communities are for the same period as for the adopting (experimental) community.
Data adjusted for inflation using Boston CPI for urban consumers, 1995 base year.

SOURCE: Massachusetts Department of Revenue, Meals Tax Database.

TABLE 3

REGRESSION ESTIMATES OF THE EFFECT OF SMOKE-FREE RESTAURANT POLICIES ON RESTAURANT RECEIPTS

Model	Best Estimate[a]	Range of Uncertainty[b]
1. Town Fixed Effects	8.6 %	4.9% to 12.3%
2. Town Fixed Effects, Corrected for Autocorrelation	5.5	-0.5% to 11.5%
3. Town and Year Fixed Effects	6.6	2.8% to 10.4%

[a] Regression coefficient

[b] 95 percent confidence interval for regression coefficient

NOTES:

1. The unit of observation for the regressions is the town-month. The period covered is 1992 to 1995.
2. The natural logarithm of monthly taxable town meals receipts is the dependent variable for all models.
3. Independent variables in the regressions are seasonal (quarter) effects and a smoke-free policy indicator (dummy) variable.

SOURCE: Health Economics Research, Inc. computations with Massachusetts Department of Revenue meals tax data.

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